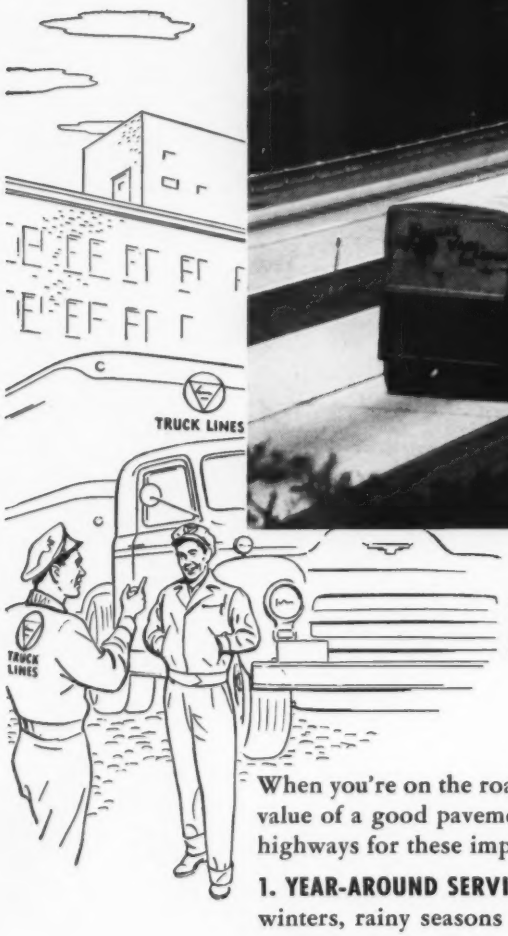
Midwest Engineer

SERVING THE ENGINEERING PROFESSION

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

USE OF GREAT LAKES WATER—PAGE THREE

Vol. 10 SEPTEMBER, 1957 No. 4



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3. GREATER SAFETY. Wet or dry, concrete's gritty texture grips tires for *quick* stops. Its low crown means better vehicle control. At night you see pavement edges and objects on the road clearly because concrete reflects far more light.

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Serving the Engineering Profession

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CONTENTS

COVER STORY

"Powder lancing," a cutting method, is speeding a huge concrete demolition job for General Electric Company's General Engineering Laboratory. Shown on the cover is the powder lance in action making a verticle cut in concrete 3 feet thick. The concrete safety walls are being cut into 18-ton sections for removal by crane. For further information see page 31.

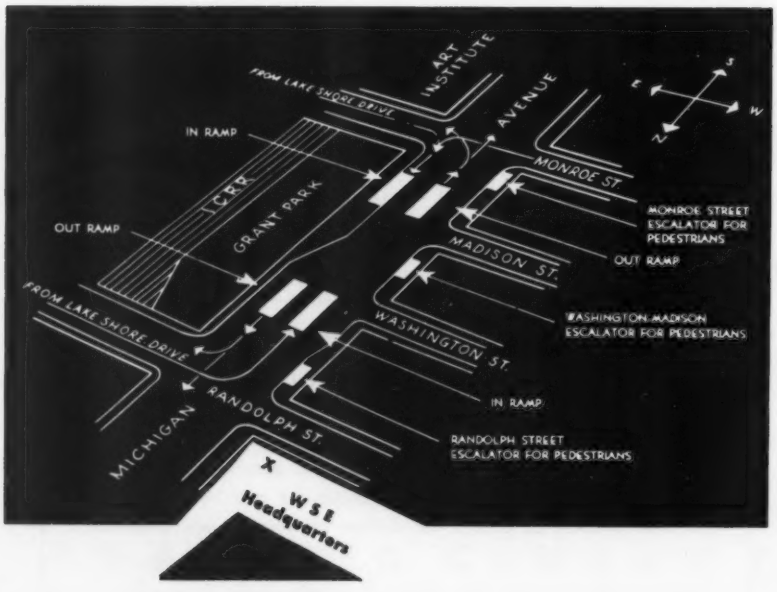
—Linde Company photo

SAY, ENGINEER!

Do you like to DRIVE?

Then why not drive to WSE meetings and other functions? There's plenty of PARKING almost at the door—the Underground Garage is diagonally across the street from WSE Headquarters (see the map below), two private garages are a block west, and the State-Wacker "Bird Cage" Garage is only a short distance away.

Below: map showing Park Department Underground Garage



Interior view of Underground Garage

If you're not driving it's still convenient to get to and from WSE meetings.

Here are handy stations or stops:

- The Cab Stand is just across the street
- The Elevated is one block west
- The Subway is two blocks west
- Buses stop at the door or within a few blocks for every part of town
- The IC Suburban station is across the street
- Other suburban stations are conveniently served by bus or elevated.

You see, your WSE Headquarters is at the handiest place in Chicago.

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CAPACITY The garage with its 2359 parking spaces, is designed to prevent overcrowding.

Use of Great Lakes Water

By Frank W. Edwards, MWSE

Water shortage which has become acute in many parts of the country directs attention to one of the world's most important sources of fresh water—the Great Lakes. The significance of the Lakes as a valuable resource is indicated by a study for an 8-county, 3100 square mile, area all within the Lake Erie Watershed in northern Ohio. (See Figure 1.) Included are metropolitan Cleveland and Akron.

The purpose of this paper is to summarize the results of the investigation. Growth possibilities, future water demands, existing and potential supplies, estimated deficiencies, plans for meeting deficiencies and cost figures are presented.

Growth Possibilities

Possibilities for further growth are excellent. Natural advantages have caused commerce, industry, science and culture to flourish in the area. More than one-third of the population of Ohio resides in these 8-counties which constitute only one-twelfth the area of the state. Also, one-third of the manufacturing plants in Ohio, which is classed as an industrial state, is located in the study area.

In addition to natural advantages which have caused expansion in the past, two new significant factors should be mentioned. They are:

a. Influence of the St. Lawrence Seaway.

b. Abundance of fresh water during a period when availability of water may limit expansion in other parts of the country.

Dynamic growth already demonstrated will continue at a rapid rate in this study area if adequate utilities are provided. Water is most important.

Future population is the key to future water use. Population is inter-related with water requirements for domestic, industrial and agricultural consumers. Using the United States Census Bureau prediction for the entire country as a guide, population forecasts for the study area are as follows:

Year	*Population*	*Percentage Increase above 1950*
1950	2,139,500	
1980	3,450,000	60
2000	4,800,000	125

Predicted Water Demands

Water consumption for three categories of use is estimated for the present, for 1980 and 2000 A.D. "Public" use includes water provided by urban systems which retail water to domestic, commercial and industrial consumers. "Private" use is water self-supplied by various industries. "Irrigation" use includes water for crops grown in open fields or under glass.

Public supplies

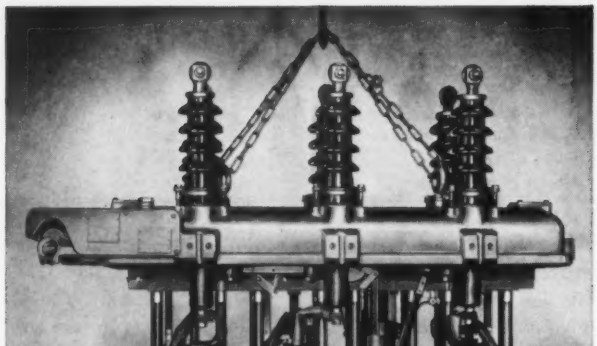
In the 43 public supplies in the area, present uses range from 32 to 346 gallons per capita per day with an average of 175 gpcd. In predicting future use from public supplies the trend of increase of various communities was determined. Recent annual increases averaging 4 gpcd were observed in Cleveland. These increases are well above the normal range of 0.6 to 1.0 gpcd. Part of this increase reflects a growth in industrial and commercial use, but also it may indicate greater use which can be expected for any urban system where abundant supply is furnished to all prospective users. A mean value of 2 gpcd annual increase is considered appropriate for the entire study area.

Private supplies

The importance of water for industry has not been appreciated fully in the past. The Ohio Department of Natural Resources, Division of Water has been a leader in collecting information on private water use and cooperated by making available for use in this study summaries of a survey in 1954 of 13,000 Ohio industries. From these the magnitude and source of existing private supplies were determined. To predict private water uses in 1980 and 2000 A.D. such factors as proximity to the lake, magni-

Mr. Edwards, manager of the Chicago office of Stanley Engineering Company, won a First Prize of $100 for this paper in the Western Society of Engineers' 1957 Prize Paper Competition.

Figure 1. Area Key Map



200 MVA for $2,478

Fast 2-Cycle* Type W Kyle Recloser for Substation Application

L-M's new Type W recloser offers the greatest advance in system protection in the past 20 years—high-speed, 2-cycle* clearing of substation feeder circuits. The unit is approximately four times as fast as the total clearing time of most modern distribution oil circuit breakers.

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The unit is completely automatic and self-contained. Series over-current tripping is available with a selection of five time-current characteristics. A complete line of supplementary accessories is also available.

The Type W has a 200 MVA interrupting rating. Unit is available in load ratings up to 560 amps; interrupting ratings up to 12,000 amps at 4.8 kv and below; 8,000 amps at 14.4 kv and below.

For more information on L-M's Type W recloser and other L-M products, see Phil McLaughlin, or C. W. ("Tiny") Puent; or phone our Chicago sales office and warehouse, Melrose Park; phone Fillmore 4-5570; in Chicago, AUstin 7-6781.

*Nominal

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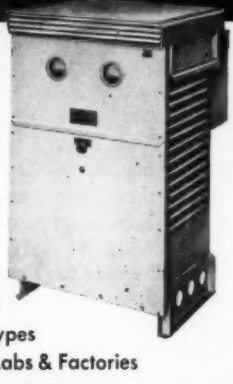

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Michigan City, Indiana

Date	*Population*	*Public (mgd)*	*Private (mgd)*	*Irrigation (mgd)*	*Total (mgd)*
Present	2,400,000	403	863	16	1,281
1980	3,450,000	745	1810	99	2,654
2000	4,800,000	1208	2850	196	4,254

Water Consumptions

tude of present use, existing types of industry in each area and expected population growth were weighed. The predictions developed in this study approximate conclusions of the U. S. Department of Commerce and the President's Water Resources Committee that the amount of water required for industry will double by 1975 A.D.

Irrigation

Irrigation in humid areas is becoming more important. This is true even in areas of excess rainfall, where rainfall pattern often does not coincide with crop requirements. Development of light weight pipe and other equipment has made irrigation practicable. On certain high value crops such as fruits and vegetables, increases of net income of $100 or more per acre as a result of irrigation are not uncommon. Much of the land in the study area, however, is not suitable for irrigation because of poor drainage characteristics of the soil. It is assumed that 20 per cent of the land suitable for irrigation will be used for this purpose by 1980 and that 40 per cent of suitable land will be used by 2000 A.D. Water consumption for the present and predicted consumptions for 1980 and 2000 A.D. for each category are shown in million gallons per day in the tabulation at the top of this page.

Potential Supplies

For all practical purposes existing supplies equal the present demand shown in the table above. Only 2 per cent of the total water supply is obtained from ground water sources. The city of Akron has exclusive rights to the major inland surface water supply, the upper Cuyahoga River, and has already developed about 40 per cent of the yield from this stream. Eighty per cent of all supplies are obtained either directly from Lake Erie or from back water areas near the mouths of streams flowing into the lake. Three potential sources of future supply are ground water, inland streams and Lake Erie.

Ground Water

In general the geology of the Lake Erie drainage basin in northern Ohio is not suitable for development of ground water supplies. Additional ground water available to meet future demands is estimated to be about 18 mgd, a rather negligible quantity on an overall area basis. Only minor development of this potential is anticipated. Therefore, ground water sources can not be depended upon to contribute much to meet future requirements.

Surface Water

Surface water supplies away from the lake are not extensive and cannot be developed readily, except for additional reservoirs on the upper Cuyahoga River now being developed by the city of Akron. Two proposed reservoirs will add 60 mgd to increase the yield from the upper Cuyahoga River to 100 mgd.

Map studies of numerous reservoir sites were made and 13 sites were selected which may prove practical for additional surface supplies. Total potential from the 13 reservoirs is about 160 mgd. The maximum potential, therefore, from inland surface supplies in the area will not exceed 220 mgd.

Lake Erie, of course, provides practically an inexhaustible supply.

Deficiencies

The entire annual runoff from the study area averages only 1,970 mgd. This compares with present usage from all sources of 1,281 mgd, predicted usage in 1980 A.D. of 2,650 mgd, and usage in 2000 A.D. of 4,250 mgd. It is not economical or possible to construct reservoirs to conserve this total runoff. Deficiencies are indicated in the paragraphs below.

Study Area

Allowing for development by 1980 A.D. of 220 mgd from surface water supplies and by 2000 A.D. an additional 18 mgd from ground water, there still remains a large deficiency when compared to predicted water consumption. The deficiencies are as follows:

By the year 1980	1150 mgd (this is 90 per cent of present usage)
By the year 2000	2730 mgd

Service Areas

The next step is to segregate deficiencies by areas in order to develop facilities to furnish water. It is probable that demands in an area approximately 10 miles wide roughly parallel to the lake shore will be supplied by existing community supply systems, expanded similar to the Cleveland system, or will be supplied by new systems developed jointly by communities and industries. It is not expected that consumption in this area will need to be met by a special water supply agency.

Critical deficiencies which are likely to be met only by a special supply agency are those in interior areas relatively remote from the lake shore. These can be served by systems defined by geographic rather than political boundaries. Study of transportation facilities, topography, and locations of communities in the study area led to selection of three service areas generally defined by the valleys of the three major rivers—Black, Cuyahoga, and Grand. Each of these areas can be served by a main trunk system with sub-transmission to central points of use. In contrast to the distribution grid serving urban areas, interconnecting pipelines between area systems are not economical when compared to the benefit that is gained.

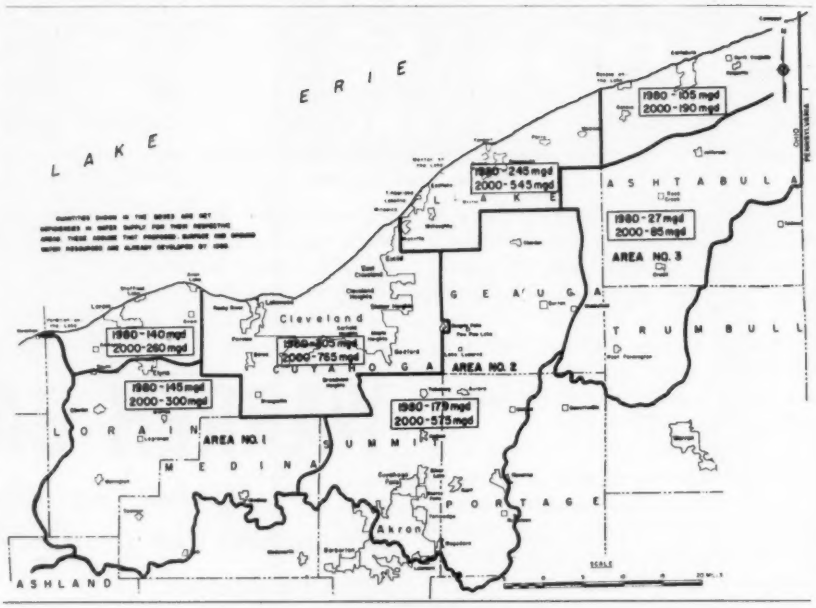

Figure 2. Deficiencies by Areas

Figure 2 shows the outlines of these areas as well as the deficiencies for 1980 and 2000 A.D. Deficiencies in the areas adjacent to the lake shore also are shown.

Lake Erie Supply Plans

Alternate plans for supply works to serve each service area designated in figure 2 were developed and analyzed. Typical construction features incorporate submerged intakes located about 2 miles off-shore, pumping stations on the lake shore and pipelines extending to interior terminal reservoirs or to the

(Continued on Page 19)

A Pencil, Instrument of Precision

With the Summer doldrums now behind them, engineers and draftsmen are returning to more productive effort than took the attention of many of them during the humid months.

There is renewed incentive to resurvey their work goals, as well as the means by which they are achieved.

While they are looking around for something to prompt their undivided attention, they might give some of it to the everyday tool which is so basic that most of us never think much about it. It seems too simple—too uncomplicated.

Actually, though, this apparently simple tool—the specialized drawing pencil—is a high-precision instrument, not only in use but also in manufacture.

In its aproximate present form, the pencil is less than two centuries old. While it would appear to be of the utmost structural simplicity, this reliable basic writing instrument is the end-result of some 126 manufacturing processes.

When the pencil is fabricated for the special uses of the drawing board, many of these steps become more meticulous than ever. A new need arises—for patience, a quality unknown to the usual assembly-line.

It took a hundred years of progressive pencil technology to evolve one of the most widely-used precision drawing pencils, the Microtomic. Its first ancestors were among the earliest products made by the 108-year-old Eberhard Faber Pencil Company, which recently moved the Microtomic's "delivery-room" from an ancient plant in Brooklyn to the world's most advanced pencil factory near Wilkes-Barre, Pa.

But in new factory or old, the process of producing Microtomics from egg to chick, remains substantially unchanged. The new facilities link together the various production steps more efficiently, but the steps themselves remain largely unaffected. There can be no shortcuts.

The critical component of the pencil is obviously its "lead"—as we persist in calling the substance which we have known for two centuries to be graphite. The making of the Microtomic lead is an interesting and delicate process.

Its basis is the purest crystalline graphite, containing 99.5 percent carbon, brought from Madagascar. Under careful controls, supervised by chemists and technicians, it is ground to a powdery fineness, each particle less than 1/25,000th inch in diameter—or many times finer than that used in ordinary pencils.

But the pencil doth not live by graphite alone. Its earliest users uneasily suspected something like that as they surveyed their hopelessly smudged hands and papers before they angrily chucked the black chunk onto the refuse heap.

Only later was it discovered—by a surgeon in Napoleon's Army—that the stuff makes an extremely useful writing implement when ground up with clay and then hardened. Later still, it was observed that the larger the percentage of clay, the "harder" the lead.

The clay for the Microtomic is brought from Germany, which has the best deposits. It is purified, dried and ground to the minute fineness of the graphite. The two substances are then blended under tremendously heavy pressure, and the blend is made into pencil leads by extrusion through diamond-dies under pressure of many tons per square inch.

To give them resistance to both stress and strain, the fresh leads are carefully dried under controlled conditions. They are now packed into crucibles and fired for several hours at a uniform 1,850 degrees F.

The cooling process is gradual, extending over 24 hours. When completed, the leads are placed in an impregnating chamber. All its air withdrawn and a special penetrating wax is forced in and maintained for an hour under pressure of 50 pounds per square inch, assuring uniform and complete absorption of the wax.

Excess wax is removed by a detergent bath kept at a standard temperature; rapid chilling directly after the bath leaves the lead surface wax-free, and the lead is ready for encasing.

The wood casing is selected from the finest Western incense cedar. It must be of straight, close grain, free of warping and checking, easy to work and light in weight.

The next few steps probably have as much emotional meaning as technical, for they betray the ancient secret (which nobody has ever really tried to keep)—of

how the lead gets into the pencil. At any rate, it disproves the antique but intriguing bit of folklore which holds that a fine hole is drilled through the length of the casing and a piece of lead of its exact diameter is slipped into it.

The casing process begins with a cedar slat slightly longer than a pencil and as wide as eight pencils lying side-by-side. At eight evenly-spaced intervals a groove is cut across the length, each to the depth of one-half of a lead's thickness.

A lead is placed in each groove. A second slat, of identical size and grooving, is coated with a special adhesive on its inner surface and is placed on top of the first, grooves meeting to form a sandwich with a lead filler. The sandwiches are then stacked in hydraulic presses and are kept under pressure for 24 hours. With adhesion complete, the slats are sliced into eight basic pencils, shaped hexagonally and sanded to a satin finish.

Seven coats of dusk-gray lacquer give the Microtomic a lustrous finish. The rest are the wrap-up details—the gold leaf stamping, the affixing of a plated metal tip with eraser and the packing.

The makers of the Microtomic hold to the policy that its manufacture demands the exacting standards of the uses to which it is put. Thus, a rigid system of mechanical testing, personal inspection and laboratory controls throughout, starting with the basic materials, has been developed.

Upon completion, the leads are tested for hardness, point retention, opacity and reproductive qualities. The cedar slats, the woodclinching, lacquering, stamping and metal tips all come under the penetrating scrutiny of trained chemists and technicians, using the most modern laboratory equipment and techniques.

Long Concrete Span

Brazil and Paraguay have announced plans to bridge the Parana River between the two countries with the longest reinforced concrete arch span ever built —951 feet, reports *Engineering News-Record*. It will cost about two million dollars. The bridge will be located near the mouth of the Iguacu River, whose confluence with the Parana marks a common meeting point of the boundaries of the two countries with that of Argentina. Iguacu Falls, a scenic attraction, will be visible from the structure.

Conversation Pieces

Thirty-six two-way conversations can be conducted simultaneously over the two cables, one of which is eastbound, the other westbound. They run from Clarenville, Newfoundland to Oban, Scotland and connect the telephone systems of England, Canada and the U. S.

Husqvarna Vapenfabriks Reports

The development of a new electrolytic iron powder, now used under know-how agreements by manufacturers in the States, Great Britain, Germany, France and Italy for making sintered parts for automobiles, calculation and other machines, and the pioneering of novel methods for producing high-grade castings were some of the latest achievements reported on in Stockholm by Husqvarna Vapenfabriks AB at a recent show. One of the leading—and oldest—enterprises in Sweden's expanding engineering industry, Husqvarna now ranks among the world's largest manufacturers of automatic sewing machines, exporting approximately two-thirds of its output of such products.

Husqvarna entered the field of powder metallurgy in 1944 when the company decided to produce sintered parts for its own products. As high-density structural parts were a prerequisite to meet the requirements for high precision, outstanding physical properties and fine surface finish, the company chose to use electrolytic iron powder and developed, in collaboration with leading Swedish electro-chemists, a method for producing it. The company also designed its own presses and furnaces. At one time the basic material used by Husqvarna for this process was steel plates from the German battleship "Terpitz" which was dramatically sunk in a Norwegian fjord by RAF bombers during the war.

In the field of foundry technique Husqvarna has done pioneering work in producing quality castings which can be graded — like quality steel — according to purpose, quality, strength and weight. The company is reported to have been the first to produce thin cast iron—1.8 mm (one-fourteenth of an inch) thick—which permits the moulding in one piece of the complete shell of a sewing machine and has also made possible the production of thin, attractive light-weight cast-iron kitchenware, another of the company's specialties. Nylon gears in sewing machines to ensure silent and friction-free running, and the world's first and—until now—only pinch-free sewing-machine shuttle are other examples of innovations introduced by the company.

Started as a Royal Arms Factory in 1689, Husqvarna passed into private hands in 1757 and became a joint-stock company in 1867. In 1872 the first sewing machines left the factory and they were accompanied by a flood of other articles, from cooking ranges to umbrella stands.

In 1896 Husqvarna made its first bicycle and in 1903 its first motorcycle —one of the earliest models of its kind in Europe. However, the manufacture of arms by no means lapsed, but instead of war weapons the company's gunsmiths utilized their centuries-old skill to produce shotguns and sporting rifles. It is estimated that in Sweden alone more than 250,000 sportsmen use Husqvarna hunting weapons and the company exports more high-class sporting rifles to the United States than any other factory in the world. A novelty in this particular manufacturing field is the world's first light-metal rifle magazine.

Besides sewing machines, shotguns, cycles and motorcycles, domestic cast-ironware and electric appliances constitute another of the company's specialties. This group ranges from lawn-mowers, washing machines, cooking ranges, meat-mincers, flat-irons, frying pans, and freezers to domestic boilers and all kinds of kitchenware. Exports of these products are considerable. Thus, some 200,000 mincers and grinders are shipped abroad annually, 50,000 lawn mowers and 20,000 ice-cream freezers. One of the latest export hits in this group is blue enamelware, known as "Blue Castenware." It derives its name from the clear blue waters of Lake Vättern on the shores of which Husqvarna is situated.

A never-ceasing effort to combine function with beauty of form is, in fact, a characteristic of Husqvarna's entire output and the road from idea to finished article is a long one. Before the blueprint stage is reached, new projects pass through the hands of some of the country's leading industrial artists to add contemporary eye-appeal. Extensive research and development also come into the picture. Every kind of material used — from pig-iron to surface lacquer—goes through the mill of microscopic, X-ray, chemical, and mechanical examination before, during, and after processing.

Inside the miniature experimental foundry and workshops of the laboratory new manufacturing methods are evolved, new products are shaped and finished articles brought back from the factory for inspection. Huge mechanical hammers batter vital parts to determine breaking point or discover structural weakness. "Tropical" rooms subject rotating sewing machines and other articles to heat and humidity tests. Special salt-spray chambers simulate seaboard conditions and refrigerating rooms subject the articles to the rigours of arctic frost. Scientific sound analyses check mechanical noise and vibration from motorcycles and other mechanical products. The noiseless efficiency of the new automatic sewing

machine is claimed to be the direct outcome of long periods of silent-running trials by the "sound-sleuth."

The company's products are not only laboratory-tested. They get a further gruelling, sometimes literally, "on the road." Each year 50 bicycles, straight from the assembly line, are hurled into the seven-day 1,250-mile "Sweden Race" running across the whole length of the country. Motorcycles get a similar shake-up in national and international races. The once-famous 44 h. p. 500 c. c. "Husky," the world's fastest TT motorcycle of the early 1930s, was taken out of production in 1935, but the 175 c. c. "Silver Arrow," introduced two years ago, and the recent 200 c. c. "Golden Arrow" have proved to be worthy followers of their glorious forerunner. They are built of chrome-lybdenum steel and light alloy and have the cylinder bore of hard chrome applied electrolytically direct to the aluminum cylinder.

AIEE Machine Tool Conference Set

The Ninth Annual American Institute of Electrical Engineers' Machine Tool Conference, featured by a program of prime immediate importance, a look backward at experience with stored intelligence systems and a look forward toward extended use of static systems of control, will be held Nov. 4-6 in the Hotel Schroeder, Milwaukee, Wis. Harry Ankeney of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is the general chairman. The conclave is sponsored by the Machine Tool Sub-Committee of AIEE.

Also featured will be addresses by William Ryan, president of the American Society of Mechanical Engineers; Ben Elliott, the University of Wisconsin; Lt. Gen. Clarence S. Irvine, deputy chief of staff, United States Air Force; and Walter J. Barrett, president of AIEE. Ryan, who will address the opening general session, will speak on "Industry's Need for Machine Tool Betterment." Elliott, head of the Mechanical Engineering Department, University of Wisconsin, will be the second general session speaker. His topic will be "Engineering of the Future."

General Irvine will be the speaker at the Monday evening banquet. His subject will be "The Changing Aircraft Machine Tool Requirement Picture Based on Manufacturing Problems Associated with 'Thermal Barrier' Aircraft and Missile Design." Barrett will address the Tuesday luncheon. His subject will be "New Thinking on Organization Policy for the Engineering Profession."

Another feature will be a panel discussion on "Machine Tool Path Control from Stored Intelligence," with George Kinney, of the Hughes Aircraft Co., and chairman of the sub-committee on Machine Tools, Aircraft Industries Association, as the moderator. Taking part will be Wallace Brainard, Kearney & Trecker Corp.; Leo Mautner, Electric Controls Systems, Inc.; Grover Bender, Glenn L. Martin Co.; Murry Kanes, Bendix Aviation Research Laboratory; John Dutcher, General Electric Co.; Bernard Galennie, Northrop Aviation; Ken Jensen, Giddings & Lewis; William Webster, U. S. Air Force, Wright-Patterson Air Force Base, Dayton, Ohio; Jack Morgan, Cincinnati Milling Co.; and E. F. Carlberg, Boeing Airplane Co.

Another panel scheduled is on pancake type motors, with Viljo Hill, of Brown & Sharpe Mfg. Co., as the moderator. Panelists include William T. Nelson, Fairbanks-Morse Mfg. Co.; R. F. Lamkey, Century Electric Motors; Vern Honsinger, Allis-Chalmers Mfg. Co.; and William D. Fournier, Reuland Electric Co.

The visiting engineers also will take inspection trips to the Square D. Co., Cutler Hammer Co., and the Allen Bradley Co.

Geology School is 10 Years Old

A unique international adventure in educational cooperation celebrated its tenth anniversary Aug. 30 with the closing exercises of the M. I. T. Summer School of Geology at Antigonish, Nova Scotia.

Sponsored jointly by the M. I. T. Department of Geology and Geophysics and the Province of Nova Scotia, this unusual school has helped educate over the past decade some 350 young Canadian and U. S. geologists. It has also resulted in new knowledge of the geology and geological resources of Nova Scotia.

Widely discussed in educational circles, the School has also been visited by scores of internationally famous geologists and other scientists. Here's how it works:

Several professors from M. I. T. and from Nova Scotia universities instruct a group of 25 to 30 students each summer in field training in geology and associated sciences at the Nova Scotia Centre for Geological Sciences at Crystal Cliffs. The project, which is administered by M. I. T., also carries on a program of student thesis work and staff research throughout the Province.

The Province of Nova Scotia, largely through the Department of Mines and to some extent through the Nova Scotia Research Foundation, provides lodging, food, and transportation for the students and staff of the school. In several cases, the Province has also provided grants and transportation assistance to students working on theses.

Students from four Nova Scotia schools —Acadia University, Dalhousie University, Nova Scotia Technical College, and St. Francis Xavier University—have an equal opportunity with M. I. T. students to participate in the instructional program and in the thesis work of the school. Students from other maritime colleges and from other schools in the United States are admitted as far as facilities permit.

Sixteen American schools besides M. I. T. have sent students to the program, with Yale having sent the most. These U. S. students have come from 36 of the 48 states. In addition, foreign students from every continent of the globe have also participated in the program.

The curriculum of the school covers a period of 10 weeks, part of which is devoted to practical field mapping and more detailed studies relating to the natural resources of Nova Scotia. In the past ten years, in fact, the youngsters at the school have set up and occupied more than 50 camp sites for their field work.

The students' field studies have concentrated on unsolved problems and many of their reports on the details of stratigraphic and structural geology have had a bearing on natural resources. Such reports on problems of an economic or practical nature have included studies dealing with gold, copper, iron, cobalt, uranium, and coal. A number of these studies have been published by the Nova Scotia Department of Mines.

This international cooperative venture in geological instruction and research was initiated by Professor Walter L. Whitehead of M. I. T., Professor Donald J. MacNeil of St. Francis Xavier University in Antigonish, and Dr. Harold D. Smith of the Nova Scotia Research Foundation. It has been sponsored and supported from the beginning by the Nova Scotia Department of Mines. Additional assistance has been given by the Nova Scotia Research Foundation, the Dominion Coal Company, and the Geological Survey of Canada.

Synthetic Soles

Of all shoes made in the U.S., about 65 per cent now have synthetic soles, reports *Chemical Week*.

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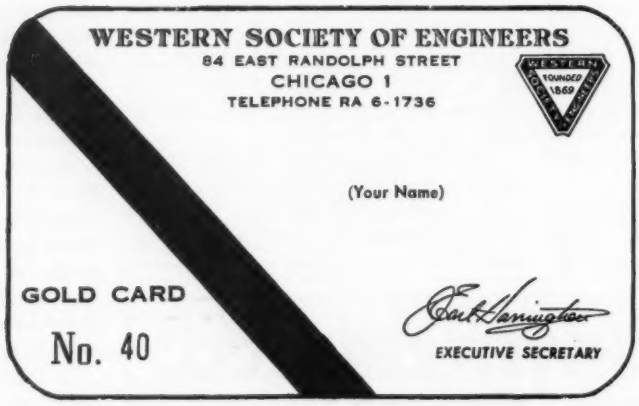

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Vacuum Furnace Aids Research

Precise industrial engineering investigations on titanium, other reactive metals, and new guided missile materials for various applications will be carried out by the General Thomas J. Rodman Laboratory of Watertown Arsenal in Watertown, Massachusetts (a Boston suburb), with the help of this new 500-pound capacity vacuum melting furnace.

Government scientists responsible for the work are Paul J. Ahearn, Assistant Director of the Laboratory, and John Zotos, Project Supervisor, both under the general direction of Philip A. G. Carbonaro, Director of the Laboratory.

The furnace is designed to produce metal of extremely high purity, free of slag inclusions and trapped and dissolved gases, by induction-melting a charge of ordinary metal and the desired alloying constituents within a high vacuum, and refining this melt by pumping out any gases which may be contained within the raw stock. After purifying, the metal is poured from the crucible into small ingot molds while still under vacuum. A 36-inch turntable within the vacuum chamber permits several molds to be poured at one time without breaking vacuum.

Alloying can be conducted more efficiently and under more precise control in a vacuum furnace since all of the oxygen and other reactive gases present in a normal atmosphere have been removed from the chamber and are not present to react with the nickel, chromium, cobalt, etc. which are added to produce the desired metallurgical characteristics. These additives are thus fully utilized for alloying and are not wasted by oxidation. Smaller quantities of these additives can be employed, therefore, which conserves costly and in some cases strategically scarce materials.

The new Stokes furnace at Watertown incorporates devices for making bulk additions of alloying constituents at the proper time during the melt through preloaded hoppers within the vacuum chamber which are filled at the time the main charge is loaded into the crucible. A vacuum lock at the top of the chamber provides facilities for breaking any "bridges" that form on the upper surface of the molten metal in the crucible, for an immersion thermocouple to give an accurate measurement of the temperature of the melt, for withdrawing a sample of the refined melt near the end of the cycle, in order to make a check of its properties just before pouring, and for making last-minute corrective additions that may be found necessary by this sampling, all without disturbing system vacuum.

Rapid pumpdown of the Watertown furnace is provided by means of a specially designed vacuum pumping system which incorporates Stokes "Ring-Jet" diffusion and booster-type oil-vapor pumps and a 500 cfm. Stokes "Microvac" rotary mechanical vacuum pump. These pumps in combination are capable of bringing the pressure within the chamber down to a level of 1 micron or less.

Fast installation of the Watertown furnace was pre-planned in the design of the unit. As a result, the unit was set in place and put completely in operating condition in only six working days. Four men, working under the supervision of a Stokes engineer, were all that were required for the installation.

Intelligent Mirror

A self-deflecting rear-view mirror has been designed that should be a boon to night drivers' eyes, *Electronics* says. A photocell is mounted over the rear-view mirror. When headlight glare from a following car is too bright, the mirror is deflected.

Architect's Sales Course Set Up

Building materials and equipment manufacturers will have the opportunity this fall of enrolling their architectural salesmen in a unique new training course aimed at improving their effectiveness in selling and servicing the architectural profession. The establishment, for the first time, of a series of schools for such training recently was announced by The Producers' Council, Inc.—an organization of more than 200 manufacturers and associations in the building industry. In making the announcement, Council President Fred M. Hauserman said that the purpose of these Architectural Sales Representatives' Institutes, as they are termed, is "to develop in the salesman an understanding of the problems and desires of the architect and his associates, and by so doing, create a harmonious and profitable working atmosphere."

Hauserman, who also heads the E. F. Hauserman Company, a Cleveland manufacturer of movable metal partitions, added "this should help establish a high standard for architectural salesmanship that will benefit the entire building industry."

The schools will be conducted on a regional basis at leading universities in conjunction with their departments of architecture. Enrollment at each school will be limited to 60 students, and classes are to be held in four sections, with 15 students assigned to a section. The course will run for a full school week—Monday through Friday—and will comprise four periods a day with an evening period devoted to study and preparation.

The first school will be held at Rensselaer Polytechnic Institute, Troy, N. Y., the week of Nov. 17, 1957. The later session will be conducted at Ohio State University, Columbus, Ohio, the week of April 20, 1958. Negotiations are currently underway for subsequent training courses to be given in Texas, California and Florida.

Salesmen-students will be instructed in a variety of subjects related to developing their abilities in working with architects. The curriculum will be divided into three phases: "Organization and Services of Architectural Firms," "How Products and Material Get Specified," and "How to Approach the Architect and His Staff."

A series of lectures will give salesmen an inside look into the operations of the architectural office. They will cover the architect's place in industry, his educational background, responsibilities of principals and associates and client relations. Other topics to be studied include: specification writing, design appreciation, bidding procedures, and contract and sub-contract negotiations.

The techniques of selling will be covered by discussions of the salesman's role as a consultant, timing of sales calls, utilizing product literature and other aids.

Each student will be encouraged to participate in classroom enactments of typical sales situations to give him the opportunity of improving his presentation and applying the selling techniques he has been taught. A case history approach will also be utilized in which salesmen must seek solutions to actual building problems with products manufactured by his firm.

By exposing himself to the comment and criticism of his instructor as well as his colleagues, the student will learn how better to interpret the features of his product or service to the architect, engineer or specifying agent. An important phase of his instruction will be the proper use of charts, pictures, models and other selling tools to support his presentation.

Classes will be conducted informally on a seminar-discussion basis, with individual personal attention given whenever possible. Graphic and audio-visual teach-

ing aids will be stressed and guest lecturers in all phases of the building and business worlds will be invited. The faculties will be composed of instructor-personnel from the cooperating universities, selected practicing architects in the area and people from industry.

The course outline was developed by Professor Raymond A. Fisher, Department of Architecture, Carnegie Institute of Technology, Pittsburgh, Pa. and L. L. Prince, American Radiator & Standard Sanitary Corporation, New York. This activity is part of the council's extensive merchandising program. Serving as chairmen of the guiding committees are David S. Miller, Kawneer Co., Niles, Mich. and Frank Uphues, Crane Co., Chicago.

At the conclusion of the course, a copy of the student's record will be forwarded to his employer. His architectural customers also will be notified of his attendance at the Institute. Students successfully completing the course will be awarded achievement certificates.

The Producers' Council maintains that by "developing a climate of understanding of the complex work-a-day problems of the architect and his associates, the sales representatives will be in a position to offer technical advice at the proper time and in such form as to be of the greatest value to the architect." According to Hauserman, the establishment of the Architectural Sales Representatives' Institutes, "is a major step forward in the continuing effort by the Producers' Council and its members to keep architects and engineers fully informed of technological developments in product use and application."

Further information regarding curriculum and admission requirements may be obtained from: Robert W. Hurst, Executive Assistant, Producers' Council, Inc., 2029 K Street, N.W., Washington 6, D. C. Membership in the Producers' Council is not necessary for training course eligibility.

Structural Design Trends to be Studied

Today's creative trends in structural design—the standards for tomorrow's buildings—will be explored at the National Construction Industry Conference to be held Dec. 11 and 12 in Chicago.

Sponsored by Armour Research Foundation of Illinois Institute of Technology, the two-day meeting on forms, materials, methods, and applications will be held in the Congress Hotel.

Purpose of the conference is to provide an interchange of ideas to stimulate further developments in structural design, according to the conference chairman, Dr. Robert L. Janes, assistant manager of mechanical engineering at the Foundation.

The meeting also will serve as a forum where leaders in the field can present to industry their current ideas and future plans, Janes said.

Foremost innovators in all phases of structural design will be featured on the program.

The morning session, Dec. 11, will be concerned with air supported shelters, hyperbolic paraboloids, thin shell structures, and cable tied structures.

That afternoon, the session on materials will include discussions on concrete (prestressed and lightweight), structural sandwiches, fiber reinforced materials, lightweight metals, and new uses for timber.

Methods to be considered the morning of Dec. 12 are ultimate design in concrete, models as analytical tools, ultimate design in steel, and computers.

Applications will be discussed that afternoon and will include talks on the Kaiser dome, Monsanto's plastic house, and application of computer methods.

Approximately 500 engineers and architects interested in developments in structural design techniques and material are expected to attend.

Western So
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Above, left to right: James E. Day, speaker; Ormas G. Smith, Western Society president; and William R. Marston.

Above, left to right: John P. Gnaeding hilip L.

Above, left to right: William R. Marston, Hjalmar W. Johnson, and John T. Rettaliata.

Above: a table charmin

rn Society
Holds
Fall Dinner

Above, left to right: George L. Jackson, James E. Day, and Ormas G. Smith.

James E. Day, president of the Midwest Stock Exchange, was speaker at the Annual Fall Dinner of the Western Society of Engineers.

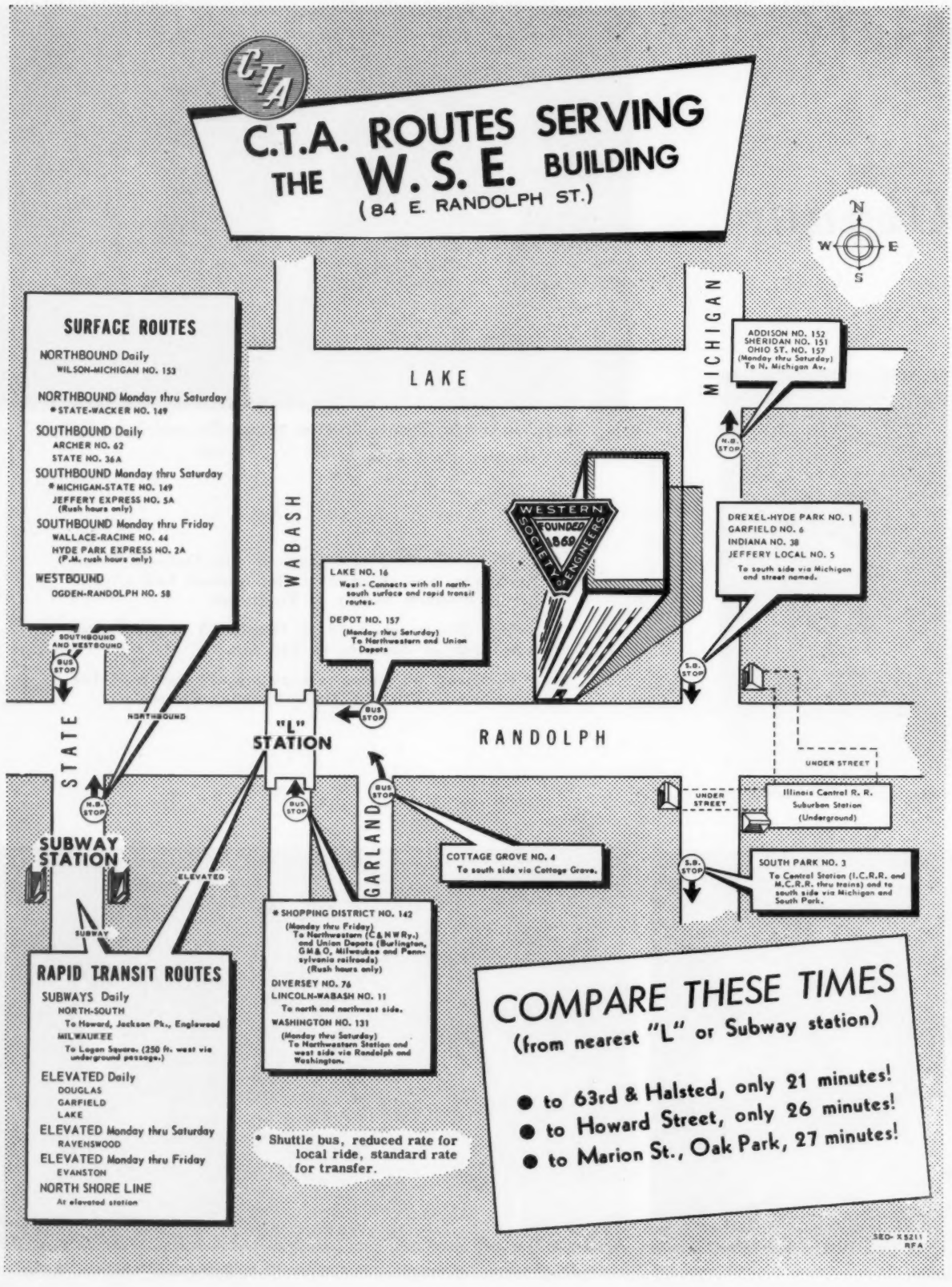
The dinner was held on October 1 at the Furniture Club of America in Chicago.

Pictured on these two pages are some of the persons who attended the interesting dinner.

ding, Philip L. Coleman, and J. Earl Harrington.

able charming ladies.

Above, left to right: Clifford B. Cox, Frank V. Smith, and Robert H. Bacon.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Great Lakes Water

(Continued from Page 6)

headwaters of the Cuyahoga River. In some cases booster stations are required at intermediate points along the lines.

In planning the supply of Lake Erie water to the service areas, certain assumptions were made regarding capacity, water treatment, and construction, operating and maintenance costs. Capacity in each area is provided in stages to match growing demands and thus minimize excess investment. The stages of construction and the capacities selected indicate only one of the many possible ways which demands may develop and may be supplied.

Water treatment at the lake shore was compared with treatment at points near ultimate use. In this case treatment prior to transmission is not economical. Public water supplies must distribute treated water, but these supplies are estimated to require only 30 to 40 per cent of future demands. Although large plants at the lake shore could treat water for a lower unit cost, it would not be economical to treat all water until demands for treated water account for about 60 per cent of total demand.

The proposed plans include transmission and a moderate amount of subtransmission facilities to deliver raw water to central points in areas of use. At these points municipalities or other government or private agencies are expected to purchase water for distribution. Public agencies then will treat the water while the private agencies may or may not treat their supplies.

Area 1

Estimated deficiency of supply in area 1 by the year 2000 A.D. is 300 mgd. The three stages of this plan are summarized below:

Stage 1—Lake intake—300 mgd capacity. Lake Pumping capacity — 100 mgd at 270′ head. Main pipe line to Elyria and subtransmission as shown.

Stage 2—Increase lake pumping capacity by 100 mgd. Construct parallel 100 mgd transmission line and extend to points further inland with booster station near Elyria—100 mgd at 150′ head.

Stage 3—Increase lake pumping capacity by 100 mgd. Construct 3rd 100 mgd transmission line and extend feeders to interior as required. Add 50 mgd to Elyria booster station and construct booster station at Grafton—50 mgd at 310′ head.

Area 2

In area 1, water was delivered directly by pipeline to central points of use. In area 2, a modification is possible wherein the Cuyahoga River is used for a portion of the transmission system. (See Figure 3.) Estimated deficiency of supply in area 2 by the year 2000 A.D. is 575 mgd. In this plan water is pumped from the lake into the upper Cuyahoga River which at this point is within 13 to 15 miles from the lake. The water flows down the natural water course into existing reservoirs thereby serving areas 35 miles or more from the lake. Subtransmission facilities to take water from the river channel to serve centers of population and industry are required in this scheme.

The four stages of development of this plan are summarized as follows:

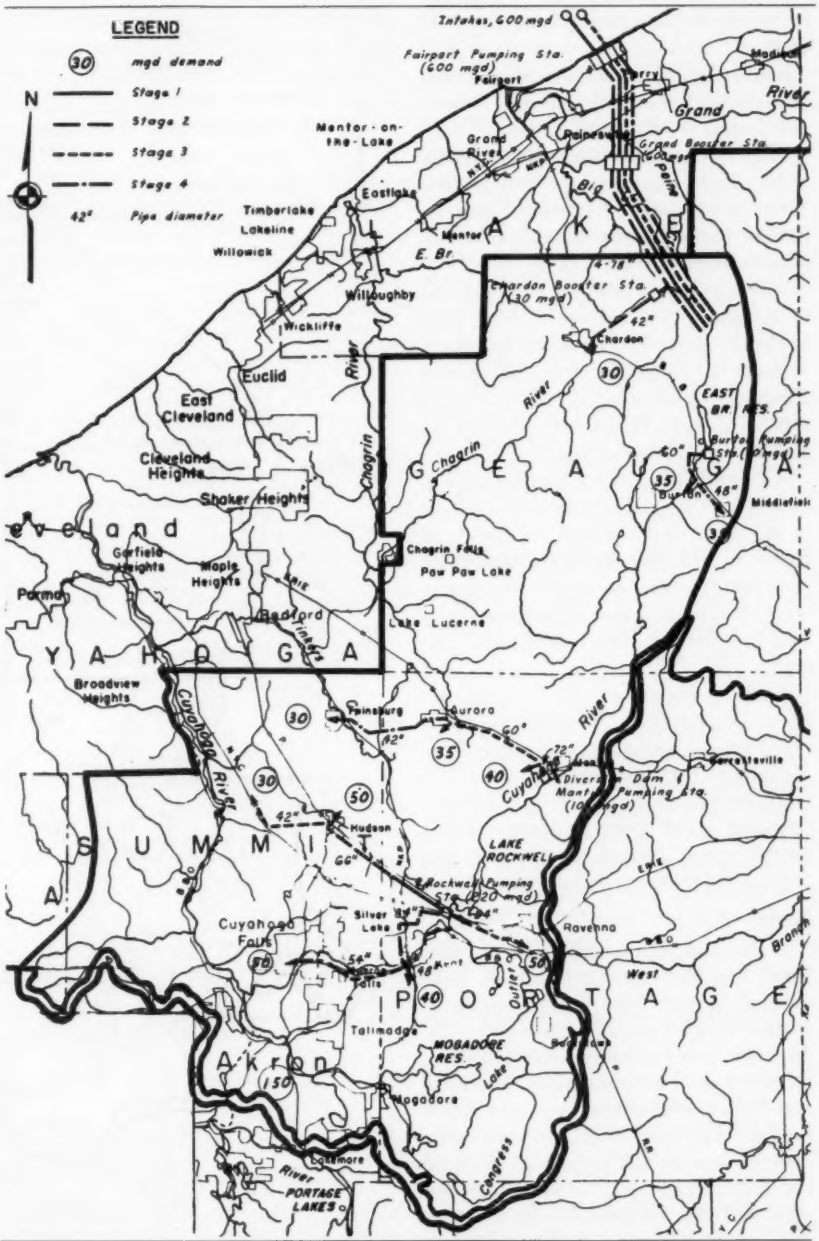

Figure 3. Area 2 — Supply System

Stage 1—Lake Intake—300 mgd capacity. Lake and booster pumping capacity—150 mgd each at 375′ head.

Pumping and subtransmission facilities at Lake Rockwell to serve Akron and nearby areas—40 mgd at 130′ head.

Stage 2—Increase lake and booster pumping capacity—150 mgd. Construct Chardon booster station and supply line —30 mgd at 110′ head.

Construct diversion dam and pumping station at Mantua and a subtransmission line to serve the area—105 mgd at 110′ head.

Increase pumping and subtransmission facilities at Lake Rockwell and vicinity —146 mgd at 95′ to 130′ heads.

Stage 3—Increase lake intake capacity —300 mgd. Increase lake and booster pumping capacity—150 mgd. Construct Burton pumping station and subtransmission lines—70 mgd at 60′ head.

Increase Lake Rockwell pumping station capacity and subtransmission lines in the vicinity—34 mgd at 95′ head.

Stage 4—Increase lake and booster pumping capacity—150 mgd. Extend subtransmission facilities to Middlefield, Twinsburg and Akron area.

An alternate plan for serving area 2, as well as a portion of the area adjacent to the City of Cleveland, is shown in figure 4. The plan utilizes a tunnel for transmission from an intake and pumping station located near downtown Cleveland to a booster station south of Cleveland.

Various stages of development are shown on figure 4. It should be noted that Stage 3 provides a pipeline from the lake to the headwaters of the Cuyahoga. This auxiliary is required to satisfy demands in the upper river basin which exceed supply in that area by the time stage 3 development is needed.

Costs

Preliminary estimates of cost of water from the 13 reservoirs, which were selected as possible future sources of surface supply, are as follows:

Average cost of water per million gallons
at 100 per cent utilization . . . $95
at 75 per cent utilization . . . $127

Cost of water from individual sites varies from as low as $58 to as high as $155 per million gallons. It is probable some sites will not be available at the time they are needed and others may not be economically feasible. Feasibility of each site must be compared to pipeline supply at the time additional supply is initiated.

Annual costs for the pipeline systems tend to stabilize around $70 to $80 per million gallons at reasonably full utilization of the supply capacity, although the average annual cost for stage 1 is $103. Raw water delivered by pipeline will be suitable for most industrial use and all agricultural use. Public supplies, however, and some industrial supplies will require treatment which will add $35 to $45 per million gallons to the cost when treated in relatively small plants located near the point of use. Undistributed treated water cost, therefore, will range around $100 to $125 per million gallons.

It is impractical to compare costs added by distribution systems because characteristics of the individual systems vary. Repumping, general and customer expenses must be absorbed. Assuming, however, that distribution facilities may

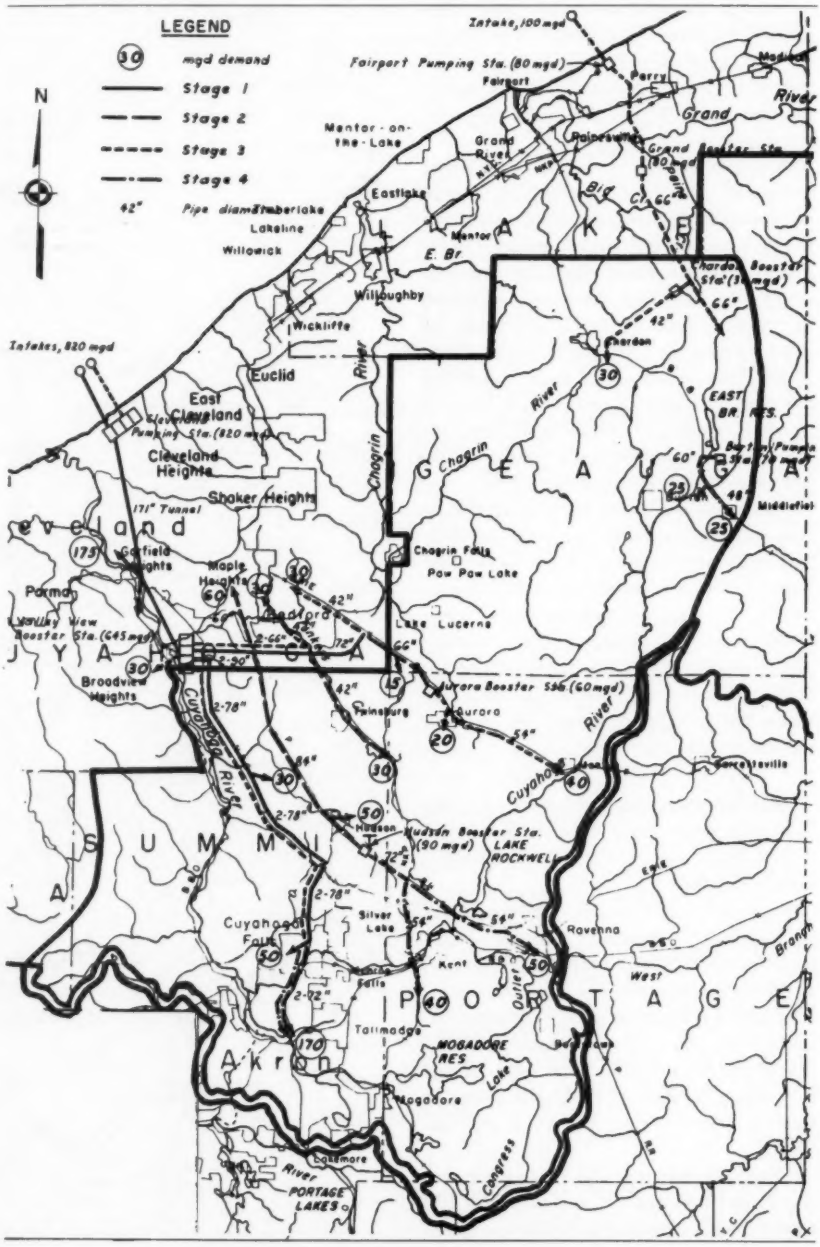

Figure 4. Area 2 — Alternate Supply

add as much as $50 to $100 per million gallons, the total cost to the user from public supply of Lake Erie water may range from $150 to $225 per million gallons.

Conclusions

Important conclusions resulting from this study are as follows:

a. Based on predicted growth of population and industry, water requirements in very few years in each of the eight counties in the study area will exceed supplies from all potential surface and ground water sources except Lake Erie.

b. Water from Lake Erie will be needed as early as 1959 to supplement supplies in some areas located away from the Lake, even if all potential ground and surface water sources in the immediate vicinities are developed in the meantime.

c. Lake Erie water can be delivered to areas located away from the lake at reasonable costs which even now are competitive with costs of water from other sources.

d. Costs of development of surface water sources in the years ahead may be expected to increase faster than costs of pipelines from Lake Erie because of more intensive use of land in potential reservoir areas.

e. Growth of domestic and industrial uses predicted in this paper can occur *only* if existing water works and potential supplies are supplemented by water from Lake Erie.

f. Immediate action to initiate expansion of water supplies by using Lake Erie water is urgent if curtailment of industrial growth in the area is to be avoided.

It is believed this investigation represents a pilot study which points to the significance of all the Great Lakes in the future expansion of the country.

Acknowledgement

The writer wishes to acknowledge the major contributions made during the course of the study by C. M. Stanley, A. H. Dunton, and C. H. Welker of Stanley Engineering Company.

Argonne Contracts For Reactor Design

Argonne National Laboratory announced Aug. 17 the awarding of a contract to United Engineers & Constructors, Inc., of Philadelphia, for the detailed design of a boiling reactor facility to be erected at the Laboratory's Idaho Division Site.

J. H. McKinley, business manager of the Laboratory, said the presently anticipated cost of the nuclear energy facility, as now planned, would be about $8,500,000.

This installation will be known as the Argonne Boiling Reactor, or ARBOR.

McKinley said the facility will provide the necessary physical plant for experiments designed to yield performance and operational data for various types of boiling reactor concepts over a wide range of conditions useful for the development of this reactor type as a source of power.

Completion of the design work has been scheduled for May 1, 1958, McKinley said. The work, he said, will be conducted by United Engineers & Constructors Inc. in cooperation with other design work on unique features of the plant which will be done by Argonne scientists and engineers.

McKinley said that it was anticipated that contracts for the erection of the facility will be awarded by about July 1, 1958.

Purpose of the plant will be to investigate full-scale boiling water power reactor systems operating at pressures up to 2,000 pounds of pressure per square inch and developing 200,000 kilowatts of heat under varying conditions.

Leonard W. Fromm, a member of the Argonne Reactor Engineering Division staff, is project manager for the laboratory on the ARBOR program.

Fromm said that ARBOR will be another major step in the development by Argonne of the boiling water concept for nuclear energy power reactors. He noted that Argonne already is operating at its Lemont, Ill., site the EBWR—Experimental Boiling Water Reactor. The EBWR is considered a promising new system for the generation of power from nuclear fuels.

The EBWR is the first reactor in the Atomic Energy Commission's power reactor program to be completed. It is a direct cycle boiling, 20,000 kilowatt (heat) reactor which provides the energy for generating 5,000 kw electricity.

Angonne's Idaho Division is located at the National Reactor Testing Station, about 50 miles due west of Idaho Falls. Argonne is operated by the University of Chicago for the U. S. Atomic Energy Commission.

Automated Oil

Upcoming fuel-oil handling systems will feature the ultimate in automation, reports *Power*. Electronics and radioactive isotopes will team up to control continuous oil supply to the burner at the right temperature and pressure. Storage-tank scanners will indicate the level, log the fuel used, and warn when the supply is low. They can go a step further and signal the supplier when to refill. Chemical additives will be automatically fed to inhibit sludge and corrosion, and improved materials will cut maintenance expense to the bone.

Aerosol Sales Record

Aerosol sales in 1956 set a new record, 320 million units, reports *Chemical Week*. The products, valued at $320 million, total more than 33 per cent above the 1955 sales mark. Leading product was hair sprays, with sales of nearly 80 million units. Insecticides, out of the top spot for the first time, racked up sales of 52 million units.

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POSITIONS AVAILABLE

C-6082 APPLICATION SALES ENGR. Grad. Mech. age abt. 35; 3+ yrs. in design of heating & cooling systems know wet & dry heat. Duties: Working with consultants on layouts & sales of wet & dry heating & cooling systems; good sales personality; position offers unusual potential, considerable travel for a mfr. of heating & cooling eqpt. sal. abt. $7500 loc. Chgo. Hdqrs. empl. might negotiate the fee.

C-6089 TOOLING ENGRS. Require men with extensive metal fabricating die exp., to analyze product design drawings, establish mfg. method & processes, & furnish estimated cost of tool & eqpt. to mfr. die fabricated parts for a mfr. of household appliances sal. up to $8,000 loc. Chgo. empl. will negotiate the fee. top industry engineers and executives

C-6434 FIELD ENGR. Grad CE or GEologist age under 35; exp. in highway or related construction exp. in soils desired. Duties: Promotional & tech. activities related to soil cement, involving collection of soil-cement performance data, condition surveys, assisting on soil cement construction & educational work. Will work with engrs. & officials in construction field. 50% travel for a trade assoc. sal. $5-650 mo. loc. Chgo. Hdqrs. employer will pay the fee.

C-6436 ESTIMATOR-CIVIL CE 3+ yrs. in estimating or gen'l office or field work for contractor, Duties: Estimating in all phases of construction on sewers, streets, shopping centers, indust. bldgs., etc. Should be able to handle purchases & coordination in the office of projects ranging from 25,000 to 500,000 sal. $125-175 wk. dep. on qualifications loc. No. Ind. employer might negotiate the fee.

C-6438 PRODUCTION ENGR. IE or ME age 40+; 10+ yrs. in production or qualtiy control, knowl. of plastic extrusion methods helpful. Duties: Assistant, understudy to production supt., supv. production schedules, work flow, costs, methods, tooling, quality control, etc. Company has own machine shop. Old established company mfg. athletic shoes & helmets now forming new line mfg. plastic extrusions sal. $8-15,000 loc. Chgo. employer will pay the fee.

C-6449 DESIGNER. Duties: Design layout & detail for installation of heating vent. & air cond. for large industrial bldgs. Sal. $7-9,000. Loc. N.W. Chgo. Suburb; employer will pay the fee.

C-6458 DESIGN ENGR. SR. & JR. Experienced in layout processing plant for coal & ore, for a consulting engr. Sal. $9-10,000 loc. Chgo. employer will pay the fee.

C-6459 PRODUCT DEVELOPMENT ENGR. Duties: To plan & develop new products with factory eqpt. for a consultant on heavy eqpt. sal. $10,000 loc. Chgo. employer will pay the fee.

C-6461 PRODUCT DESIGN ENGR. ME degree age 32-45; Duties: To head up product design section primarily the design of industrial rotary positive displacement pumps, fluid motors & accessory eqpt. Will lead to position of Asst. Chief Engr. for a mfgr. sal. $10,000 loc. Chgo. employer will negotiate the fee.

C-6462 ASST. TO STAFF ENGR. 4 yr. engrg. education age to 35; experienced mech.-met. engr. furnace experience if possible, knowl. of refactories & alum. Duties: Assist Staff Engr. in preparing sales drawings, estimating, preparing proposals & correlating data. Possible field liaison & expediting on industrial furnace installations, limited travel for a mfgr. sal. $6-8000 loc. Chgo. employer will pay the fee.

C-6463 SALES ENGRS. (2) age to 40; Exp. sales engr. with arch. background or struct. engr. with sales background. Knowl. of light weight aggregate & pre-stressed concrete helpful. Duties: Sales engr. for light weight aggregate for exploded shale mfgr. One for prestressed concrete sal. $500 up loc. Chgo. employer will pay the fee.

C-6465 SALES ENGR. EE age abt. 35; 10 yrs. in sales of services to commercial utilities. Duties: Work with utilities in sales dept. of both commercial & residential, selling services for a utility company sal. to $650 loc. Chgo. employer will negotiate the fee.

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833-MW: SALES ENGR. 40 BSME abt. 10 yrs. exp. both inside sales & in the field; in insulation & bldg. materials field, $7500 Chgo. area, 20% travel.

797-MW CHIEF ENGR. (electronics or communications engr.) 57 BSEE over 20 yrs. diversified exp. in research & devel. of electronics & communications apparatus & circuits, many patents, willing to relocate.

791-MW: CHIEF STRUCTURAL ENGR. or PARTNER age 36 PhD-Univ. of Illinois Desires chief structural engr. or partner of firm. Varied experience, excellent references $12,500.

483-MW: MINING SUPT. 48 BS in Mining 18 yrs. exp. in production engrg. & management. Resp. in hard rock & coal mines, quarries, $10,000 U.S.

NOISE Control Expands Field

NOISE Control magazine, a publication of the Acoustical Society of America, announced in New York on Aug. 27 that it is expanding its field of coverage of scientific subjects to include shock and vibration control. The Acoustical Society is a member society of the American Institute of Physics.

Lewis S. Goodfriend, editor of *NOISE Control,* said that the addition of vibration control information in the publication will provide more data on the elimination of noise at the source.

"Noise," he points out, "is the airborne counterpart of mechanical vibration. Whenever there is mechanical vibration, it can be converted to airborne noise by means of a radiating surface."

In addition to being produced by vibration, noise is also associated with shock phenomena. Both acoustical and mechanical shocks produce noise and are capable of producing very high level noise.

The new material starts appearing in *NOISE Control* beginning with the September issue which features articles on vibration and shock including a paper by Dr. Walter Ramberg, chief of the Mechanics Division, National Bureau of Standards.

In subsequent issues there will be discussions of devices and materials used to isolate vibration and current problems in industrial and military installations.

The magazine is now in its third year and is written for the engineer, architect and hygienist specifically and for everyone responsible for a suitable, safe acoustical environment. Recent issues of the publication have considered noise problems in heating, ventilating and air-conditioning systems; industrial zoning and community noise; motion picture, radio and television studios; conservation of hearing in industry; and an examination of hearing and bio-acoustic problems to be solved in the armed forces.

One recent issue of *NOISE Control* carried an editorial by Mr. Goodfriend in which he said that criteria must be set now for the noise limits of jet airplanes in order to prevent public misinformation and expensive time-consuming lawsuits.

He called for a "realistic attitude" by the press and public to prevent expensive legal battles and bitter arguments over the right of jet planes to land at airports.

"Now is the time," according to the editor, to set these criteria. As jets come into use for commercial air transportation, then the noise they make can be compared to the criteria and "approved or banned".

"This is a job for airport operators, acoustical engineers, and lawmakers. It must be done soon, or much of the misinformation now directed to the public will become so firmly rooted that any reasonable solution to the problem will have to await the outcome of litigation. expensive time-consuming litigation."

He said that a "haze of statements" by plane and engine manufacturers, newspaper reporters and airport personnel have confused the picture of jet-engine noise and its effect on people.

The editor cited these facts:

1. Jet engines make more noise when they provide more thrusts such as under heavily-loaded conditions.

2. Noise determinations of jet planes must be made by qualified experts in sound to get accurate readings.

3. When the Port of New York Authority bans a jet airplane, that means it is too noisy at present. This does not mean that aircraft in the future will be too noisy for use.

4. Clearance of the French Caravelle jet plane at Idlewild Airport does not mean that the Port Authority of New York has lifted its ban for other jets. The editorial says, "The noise characteristics under operational conditions will be studied for each jet aircraft before it is permitted to land in New York, and permission will be granted only if its noise output is less than that of presently operating piston-engine aircraft."

5. Air Force personnel are not becoming hard of hearing at a rapidly growing rate. "The Air Force has an intensive hearing conservation program in effect, and records show no increase in the number of discharges due to loss of hearing since the introduction of jet engines on Air Force craft."

New Metal Melting Process Developed

A simple, inexpensive way to produce purer high melting point metals has been developed at Illinois Institute of Technology.

The new process, patented by Dr. Lucio F. Mondolfo, director of metallurgical engineering, produces titanium, zirconium, chromium, hafnium, niobium, and vanadium directly from their oxides.

"Experiments with the new method yield purer metals than can be obtained by present methods, even after years of development and improvement," says Mondolfo.

In the new method, the oxides of the metals to be produced are reacted with aluminum under such conditions that complete removal of oxygen is accomplished.

Use of these easily oxidized metals previously has been hindered by high production costs and the difficulty of producing sufficiently pure, ductile metals.

Titanium is used in the construction of supersonic planes; zirconium is important for atomic reactor construction, and chromium is utilized in jet engines and gas turbines.

Patent number assigned to the new process is U. S. Patent 2,803,536.

Reviews of Technical Books

Lubrication

Theory and Practice of Lubrication for Engineers, by Dudley D. Fuller, John Wiley & Sons, Inc., New York 16, N. Y. 1956. Pages, 432. Price, $10.50.

Ranging from basic concepts of friction and lubrication through their correct applications, the new book carries through three major objectives. Dr. Fuller systematizes and generalizes the principles, demonstrates the wide range of usefulness of lubrication analysis in solving engineering problems, and clarifies the restrictions and modifications of lubrication theory that are vital to its successful application. In keeping with his aims, the author develops hydrodynamic and hydrostatic theories from simple and readily understood principles, employing the easiest mathematical methods possible. The restrictive assumptions on which the hydrodynamic and hydrostatic theories are based receive emphasis, as does hydrostatic lubrication, and hydrodynamic action is generalized and applied to many different geometries.

Individual topics covered are: fundamentals of viscosity and flow, viscosity and its variables, hydrostatic lubrication, hydrostatic squeeze films, hydrodynamic lubrication, hydrodynamic lubrication of journal bearings, friction and power losses in journal bearings, typical industrial bearings, air-lubricated bearings, dry friction, boundary friction, and bearing materials.

Dr. Fuller is professor of mechanical engineering at Columbia University. He is also principal scientist at The Franklin Institute Laboratories for Research and Development and is chief of the friction and lubrication section.

Axial Flow Pumps

Centrifugal and Axial Flow Pumps, by A. J. Stepanoff, John Wiley & Sons, Inc., New York 16, N. Y. Second edition, 1957. Pages, 462. Price, $12.00.

The increase of pump sizes and speeds has led Dr. Stepanoff to add a new chapter: "Water-Hammer Problems in Centrifugal Pump Systems," to this revised and expanded work. He supplies recent information in the chapter dealing with centrifugal-jet pump systems, and has expanded the problem of the shut-off head for axial and mixed flow problems. Also extended are the principles of suction sump design for vertical propeller pumps.

Dr. Stepanoff's revision includes a modern viscosity correction chart, new complete characteristics of mixed flow and axial pumps, and an account of the progress in water storage pumps. The author introduces a thermal cavitation criterion which correlates cavitation data on the basis of physical and thermal properties of liquids. Among the further fresh material are charts relating to impeller design for any discharge angle, and a procedure to select the casing design elements to suit impellers.

Dr. Stepanoff has been with the Ingersoll-Rand Company in Phillipsburg, New Jersey since 1940, as a development engineer.

Passive Networks

Synthesis of Passive Networks, by Ernst A. Guillemin, John Wiley & Sons, Inc., New York 16, N.Y. 1957. Pages, 741. Price, $15.00.

A logical, complete, and consistent theoretical basis for all linear passive synthesis procedures appears in this work. The new volume discusses both the approximation problem and the realization techniques which are the two essential parts of synthesis procedure.

Assuming the previous acquisition of mathematical tools and theory of circuit analysis, and allowing for no shortcuts, Dr. Guillemin deals with realization theory and methods in the first thirteen chapters. The chapter headings here include: properties of driving-point and transfer impedances; driving-point and transfer functions of two-element-kind networks; synthesis of *LC* driving-point impedances synthesis of *RC* and *RL* driving-point impedances; more about equivalent and reciprocal networks; properties of two terminal-pair networks; synthesis of lossless two terminal-pair networks; real-part sufficiency and related topics; synthesis of *RCL* driving-point impedances; transformerless driving-point impedance synthesis; conventional methods of transfer function synthesis; other methods of realizing transfer functions; and *RC* transfer function synthesis.

Dr. Guillemin is professor of electrical communication at the Massachusetts Institute of Technology.

Linear Algebra

Linear Algebra for Undergraduates, by D. C. Murdock, John Wiley & Sons, Inc., New York 16, N.Y. 1957. Pages, 239. Price, $5.50.

Elementary in treatment, the new book keeps abstract ideas to a minimum, while geometric motivations and applications for the abstract algebraic theorems are stressed. Chapters are devoted to: vectors and vector spaces; matrices, rank, and systems of linear equations; further algebra of matrices; further geometry of real vector spaces; transformations of coordinates and linear transformation in a vector space; similar matrices and diagonalization theorems; reduction of quadratic forms; and vector spaces over the complex field.

Largely written for the student, *Linear Algebra for Undergraduates* contains material of use to physicists, engineers, mathematicians, and statisticians. Dr. Murdoch avoids abstract algebra in his treatment of the properties of matrices and quadratic forms of importance to physicists, and includes some applications to differential equations and physical problems.

Foundation Seminar Conducted

Prominent civilian and military engineers took part in a seminar discussing "Economy in Foundations and Pavements" at the U. S. Naval Construction Battalion Center in Davisville, R. I. on Sept. 6.

The seminar was one of the highlights of the first national reunion of former Seabees and Civil Engineer Corps officers, held to celebrate the fifteenth anniversary of the Seabee Center at Davisville. The reunion program covered Sept. 6, 7, and 8.

Experts in the managerial, design, construction, and contracting fields contributed to the discussion. Formal presentations of practical examples and money-saving techniques used by participants were followed by an airing of "pros" and "cons."

The significance of the seminar was keyed to recent Congressional appropriations towards some 41,000 miles of federal highways.

Speakers and their topics were: Captain H. Garner Clark, CEC, USN, commander, Naval Construction Battalions, U. S. Atlantic Fleet: Owner's Requirements; John L. Hayden (A & E), Hayden, Harding & Buchanan: Design Criteria and Specifications; Charles Richardson, contractor for B. Perini & Sons, Inc.: Design Criteria and Specifications; B. J. Katz, Bureau of Yards and Docks: Contractural Aspects; Robert P. McKendrick, exec. vice-president, Construction Ind. Manufacturers' Assoc.: New Developments in Equipment; Charles B. Kiesel, Jr., manager, Prestressed Dept., Raymond Concrete Pile Co.: Cost-Saving Construction Techniques; Gordon K. Ray, Highways & Municipal Bureau, Portland Cement Assoc.: New Developments in Materials; and Robert B. McKeagney, managing engr., Atlantic Gulf Div., Asphalt Institute: New Developments in Materials.

The discussion panel consisted of the speakers and Colonel Franklin Johnson, U. S. Army, asst. div. engineer for military construction, N. E. Division, Corps of Engineers; John Volpe, of Volpe Construction Co., Malden, Mass. (the former commissioner of public works, Commonwealth of Massachusetts) ; G. G. Werner, Jr. (contractor), Merritt-Chapman & Scott Corp.; Joseph Vallone, commissioner of public works, State of Rhode Island; and John Morton, commissioner of public works, State of New Hampshire.

Captain Joseph P. Plichta, CEC, USN, Public Works Officer for the First Naval District, was panel moderator.

In addition to the seminar, there was a series of exhibits and demonstrations of various construction equipment and techniques on Sept. 7.

Davies Addresses Engineers' Council

Clarence E. Davies, one of the founders of the Engineers' Council for Professional Development and secretary of The American Society of Mechanical Engineers, was the speaker at the Silver Anniversary Dinner of the Engineers' Council for Professional Development, the major function of the General Assembly, scheduled Thursday, Oct. 24 at the New York Statler. The General Assembly, a two-day meeting, which was expected to draw engineers and engineering educators from coast-to-coast, marks the first meeting sponsored jointly by ECPD and Engineers Joint Council.

The morning session on Thursday considered military service and professional development. This was followed by a luncheon at which Joseph W. Barker, president of EJC and Morris D. Hooven, president of ECPD, discussed the present and future of their two organizations.

The Thursday afternoon meeting considered the community college and trends in engineering education with respect to the two-year post high school curriculum in technological education. Panel members included E. K. Fretwell, Jr., assistant commissioner for higher education, University of the State of New York and Otto Klitgard, president, New York City Community College of Applied Arts and Sciences.

On Friday morning, Oct. 25, a panel of speakers discussed the need for management training for engineers. Panel members included Frank W. Miller of the Yarnell Waring Company, Harry Krieger of the Radio Corporation of America and William E. Mullestein of the Lukens Steel Company.

Dana Young, dean of engineering, Yale University, was the Friday luncheon speaker. On Friday afternoon, a panel considered the developments in combining graduate engineering education with engineering employment. Participants included Paul Hemke, Vice-President, Rensselaer Polytechnic Institute, S. Ingram of Bell Telephone Laboratories, E. Weber of Polytechnic Institute of Brooklyn and R. W. Rowsen of the Fansteel Corporation.

The General Assembly program was an exploration of the essential unity and complementary nature of the goals and purposes of ECPD and EJC. The regular council and committee meetings of ECPD were held simultaneously with the Assembly program. The General Assembly represents the combination of 17 national engineering groups.

Smaller Wheels

American motorists may soon be riding on smaller wheels, reports *National Petroleum News*. Car manufacturers are producing 13-inch wheels and tires on an experimental basis. The wheels are proving satisfactory, but designers are having trouble shrinking the brake drum.

News of Engineers

William C. Norris, former vice president and general manager of Remington Rand Univac Division, St. Paul, has been elected president of a new Twin City engineering firm, Control Data Corporation, it was announced.

Norris, who recently announced his resignation from the Remington Rand post, said the new company will perform research and development work in the fields of data processing, instrumentation and controls and other areas related to automation.

Norris, who directed a number of important electronic developments for the Navy during World War II, was one of a small group of men who organized Engineering Research Associates in St. Paul in 1946. The company became a pioneer in the field of electronic computers and originated many of that industry's most successful techniques and systems.

ERA had already grown to 1,500 employees when, in 1952, it was purchased by Remington Rand. Norris was then named a vice president and put in charge of the new Remington Rand activity, a position he has held until now.

Temporary headquarters for Control Data Corporation have been leased in the McGill Building, 501 Park Avenue, Minneapolis, Norris said, where space is available for present administrative functions and engineering activities.

* * *

Harry E. Erickson, MWSE, of D. A. Stuart Oil Co., Ltd. has been appointed manager of the new plant in Bayonne, N. J., where metalworking lubricants and extreme pressure oils and greases will be manufactured.

Erickson, a native Chicagoan, received his B.S. at the University of Illinois, where he majored in Mechanical Engineering. Chemistry also proved to be a fascinating study for him and, with an early background and training in this field, he was particularly qualified to enter into employment in 1940 with D. A. Stuart Oil Co., Ltd., specialists in industrial oils and lubricants. He joined them as laboratory assistant, progressing to become chief engineer, later director of Engineering and Research, and finally assistant to the general manager. In this capacity he has traveled to Europe to observe engineering and machining methods and consult with lubrication experts, as well as lend assistance where possible to manufacturers.

He has served as treasurer of the Chicago Chapter of the American Society of Mechanical Engineers, and a faculty member of the Education Committee of the American Society of Lubrication Engineers. He is also an active participant on committees in connection with many engineering societies including the American Petroleum Institute, American Society of Testing Materials, American Society for Metals, Society of Automotive Engineers, National Lubricating Grease Institute, and has assisted with the work of the Coordinating Research Council in connection with cutting oils and lubricants. He has written many technical papers and given talks before engineering groups throughout the United States and Canada.

* * *

Herbert Hoover, 3rd, of San Jose, Cal., son of the former under secretary of state and grandson of the former president of the United States, HMWSE, has been elected a junior member of the Society of Petroleum Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

His father and grandfather are members of AIME, the former President of the United States being the senior past president of the Institute. The uncle, Allan Hoover, of Greenwich, Conn., also is an AIME member.

Herbert Hoover, 3rd, was educated at Stanford University and the University of Arizona and to his degree of Bachelor of Science added that of M.B.A. at the Harvard Business School.

* * *

John F. Sullivan, III, Member of Western Society, recently became associated with Kaiser Aluminum & Chemical Sales, Inc. Mr. Sullivan is an analyst in Market Research with the firm which is located in Chicago.

Members of Western Society will recall that Mr. Sullivan received a special Service Award at the 1957 Annual Spring Dinner for his part in organizing a branch of Western Society at the University of Illinois.

* * *

Dr. William L. Everitt, dean of the college of engineering of the University of Illinois, received the American Institute of Electrical Engineers' medal in Electrical Engineering Education for his outstanding service as a teacher in electrical engineering. Presentation was scheduled for the Institute's general meeting in Chicago, Oct. 7-11.

* * *

Louis R. Howson, MWSE, senior partner in the consulting engineering firm of Alvord, Burdick & Howson, has been nominated to the National Presidency of the American Society of Civil Engineers, the nation's oldest engineering society. Howson took office in October. Mr. Howson's activities in ASCE, prior to his nomination to its highest office, include serving as chairman of many important committees, as director and vice-president, and as a member of its Executive Committee.

Mr. Howson's active interest in Western Society of Engineers is well known to all its members. He has been a Life Member of Western Society since 1948. He became a member of the Society in 1918 and in 1937 he was elected President. During his tenure in office, Mr. Howson laid particular emphasis on the role of the individual WSE member aiding the Society in its progress.

His many contributions to the advancement of the engineering profession, particularly in the field of hydraulic and sanitary developments, have made Mr. Howson well known throughout the engineering profession both here and abroad. His work over the past 45 years in planning and implementing these developments rank him as one of the nation's leading authorities. Mr. Howson's studies of flood control, water supply, sewerage and sewerage disposal, and public utility evaluations have, in several instances, been the first made in many areas. His opinions in the fields are regarded so highly that, on no less than four occasions, he testified before the U.S. Supreme Court in cases regarding sanitation at Chicago and diversion of water from Lake Michigan.

Mr. Howson's many friends in Western Society of Engineers join with the whole engineering profession in congratulating him and wishing him every success during his tenure of office.

* * *

The first recipient of a new award, to be known as the Timoshenko Medal, will be the man for whom it was named, Professor Stephen P. Timoshenko, formerly of Stanford University, it was announced Aug. 28 by The American Society of Mechanical Engineers. Professor Timoshenko, cited as a distinguished member of the engineering profession, is credited with "outstanding contributions to the field of applied mechanics."

The award, establishment of which was made public Aug. 28, was conceived and planned by the Applied Mechanics Division of ASME, which Professor Timoshenko helped to found. Administration of the award in the future will be the responsibility of the ASME Medals Committee. According to the announcement, the medal will be given to "individuals in recognition of distinguished contributions to applied mechanics without restriction as to nationality or profession."

Dr. Timoshenko, a native of Russia who left that country in 1917, was, until his official retirement in 1946, professor of theoretical mechanics at the University of Michigan. As part of his ASME work he helped make possible publication of the *Journal of Applied Mechanics.* Author of many books in Russian, he was co-author of the book *Applied Elasticity*, written in English. He is the recipient of several other ASME awards, among them the Worcester Reed Warner Medal "for contributions to the theory of the design of elastic structures and dynamics of moving machinery," and honorary membership, the highest award the Society bestows. In 1947 he won the James Watt International Medal of The Institution of Mechanical Engineers, London, England.

The first Timoshenko Medal will be presented during the ASME Annual Meeting, at a banquet on the evening of December 4, at the Hotel Statler in New York City.

Tests Improve Wood Laminates

Fabricating procedure for such products as laminated railroad ties, utility poles and steam bending stock at the high moisture contents they will be subjected to in service, have been determined from tests conducted by Timber Engineering Company, Washington, D. C., research affiliate of the National Lumber Manufacturers Association.

According to data developed by the lumber industry-owned wood products laboratory, it is possible to laminate products at fiber saturation, which the products will reach in service, to lessen glue line stresses, caused by volume changes in the laminates, due to the absorption or loss of moisture after gluing.

To determine the gluability of steam bending stock at high moisture content, tests were run on untreated and preservatively treated red oak at moisture contents approximating fiber saturation. Studies were also made of the effects the adverse conditions of steam bending have on glue lines of laminated untreated and preservative treated red oak at high moisture contents.

The tests developed valuable data on the gluability of red oak at fiber saturation. Untreated and treated red oak were successfully bonded at moisture contents approximating fiber saturation, and were successfully steam bent to a critical radius of curvature with no appreciable weakening of the glue joints.

The tabular results of the tests and written report are contained in the article, "Gluing Untreated and Preservative Treated Red Oak at Fiber Saturation," by William J. Finnorn, chief of Timber Engineering Company laboratory's Glued Products Section.

Black Picture

If the public were to rely on television programs for its information on mines, it would get a pretty black picture, reports *Engineering and Mining Journal.* A survey found that in the thousands of television plays in the past three years, mining has figured in only three. In all cases, the mine was a coal mine. The stories all dealt with explosions and the effect on the miners and their families.

WSE Applications

In accordance with Article I, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the MIDWEST ENGINEER magazine.

A. C. Van Moffaert, Preliminary Layout Engr., J. F. Meissner Engineers, Inc., 300 W. Washington St.

Dr. R. S. Ziehn, Teacher, Chicago Technical College, 2000 S. Michigan Av.

G. R. Nelson; Mgr., Htg. & Air Condition'g., Northern Illinois Gas Company, 615 Eastern Av., Bellwood, Ill.

Douglas T. Clough, Senior Designer & Checker, Admiral Corp., 3800 W. Cortland St.

Electric Motors Favored by Refiners

The general trend for answering power requirements in the petroleum refining industry "is toward the use of an increasing proportion of electric motors as compared to steam turbines."

So the American Institute of Electrical Engineers' Conference of the Petroleum Industry was told in Philadelphia on Sept. 11 by Lee B. Eddy of the Universal Oil Products Co., Des Plaines, Ill.

"As the electric generating capacity and distribution system reliability of our country increase," said Eddy, "it is to be expected that electric motors will take over an even larger portion (than they have now) of the muscle work in petroleum refineries."

Eddy pointed out that the power requirements of oil refining processes have increased significantly in recent years. He said that the electric motor and steam turbine which closely compete with each other for the task of driving pumps, compressors, and other rotating machines in the world's refineries, are the two most popular types of drivers.

"In many applications," he said, "the output characteristics of these drivers are equally suited . . ."

As a result of his detailed study of the factors determining the use of the proper driver, Eddy reached the following general conclusions:

1. In locations where the electric power supply is subject to frequent and lengthy outages, electric motors should not be used on any critical drives except where spared by an adequately supplied steam turbine or other prime mover.

2. Where electric power supply is dependable and of reasonable cost:

a. Sufficient non-condensing turbines (preferable of the larger horsepower ratings) should be installed to provide all the low-pressure steam requirements. These should include the drivers for any service requiring a variable-speed input or where a momentary driver failure would result in an extended plant shutdown for maintenance or clean out.

b. All other small drivers should be electric motors.

c. Large drivers which may be either motors or condensing turbines should be selected on the basis of a detailed economic study considering first cost, operating cost, and payout time.

Busy Blackboard

A mechanical blackboard that erases itself automatically to find the best of two billion-billion possible answers to a problem has been developed by the University of Michigan reports *Electronics*. The board provides short cuts in 20 minutes to answers that would take a big electronic computer years to work out the long way.

Power Lines Cross Nine Miles of Lake

The Creole Petroleum Corp. decided to install overhead transmission lines, rather than submarine cables, from the shore of Lake Maracaibo, Venezuela, to a spur nine miles out in the lake because of less initial cost, it was reported in Philadelphia Sept. 9 at the American Institute of Electrical Engineers' 1957 Petroleum Industry Conference.

A study also showed that overhead lines also could be utilized for future large increases in load, A. E. McCollum, Creole Petroleum Co. engineer, said in a paper, "Long-Span Transmission Lines for Maracaibo Oil Fields."

McCollom's paper, based on a study made by Ebasco Services, Inc., described the investigation made in preparation for construction of a transmission line known as the San Matias Spur Line.

"Two-circuit long-span overhead transmission lines are the desirable, practical, and economical means for providing 34.5 KV off-shore circuits in Lake Maracaibo, if more than a single circuit without alternate supply is required for the service," he said. "Submarine cables compare favorably in first cost with overhead lines for single-circuit radial 34.5 KV service in medium and deep water, if no investment is made or assigned to supply duplicate service.

"To serve further large increases in load, which may result either from changes in oil production methods, or from extension of activity to new concessions located farther off shore, additional transmission capacity will be available at low incremental cost in a system of 34.5 KV overhead lines . . . by raising voltage. This potential future

value is not inherent in an alternative system of 34.5 KV submarine cables."

The Ebasco study, McCollom said, showed two circuit submarine cables for the spur line would cost from $1,522,000 to $2,290,000 compared with $995,000 for two circuit overhead construction.

The Creole Corporation operates a 42,500 KW generating station, with 48 per cent of the load used for off shore pumping of oil from wells to storage and loading facilities, and for electric auxiliaries of gas turbine driven compressors which reinject gas into oil-bearing strata to maintain pressure as oil is withdrawn, he said. Most of the off shore transmission lines are overhead, with submarine cables being utilized to transmit power from off shore substations to individual well operations.

Powder Lancing Cuts Concrete Wall Slabs

A highly practical process known as powder-lancing is speeding a huge concrete demolition job for General Electric Company's General Engineering Laboratory, Schenectady, New York. The Laboratory's Building 258 formerly housed a high-speed pit having concrete safety walls up to 4 ft. thick for testing steam turbines. Part of the building is now being converted into a new million dollar radiation laboratory scheduled for completion in 1958. Before construction can get under way, however, the walls must be modified and over 8000 cu. ft. of concrete removed.

The most economical and practical means of doing this is by powder-lancing, an outgrowth of the powder-cutting process first introduced in 1943 by Linde Company, Division of Union Carbide Corporation, as a method of cutting stainless steel. Today powder-lancing is widely used in the steel industry for producing shot holes in open-hearth furnace slag pockets. However, due to recent apparatus developments and new operating techniques, it is now practical to cut thick concrete — especially where mechanized demolition methods are too costly, where time is an important factor, and where blasting cannot be employed. With the powder lance, concrete may be demolished in huge sections, moderate sized boulders, or smaller pieces—as conditions require.

In powder-lancing, a mixture of iron and aluminum powder is fed pneumatically into a lance handle and mixed with oxygen. The lance itself is manually operated and consists of a lance handle with one or more lengths of black iron pipe attached. The powder and oxygen are mixed in the lance handle, carried to the cut by the pipe, and produce a bombardment of burning iron and aluminum particles which melts the concrete. Cuts in concrete 12 ft. thick have been made with the lance, but theoretically there is no limit to the depth of the powder lance's cut.

Here's the part that powder-lancing is playing in paving the way for General Electric's new radiation laboratory.

The turbine testing pit is shaped hexagonally and consists of two concrete safety walls separated by 6 ft. of packed sand. The inner wall is 3 ft. thick, and the outer wall 4 ft. thick. Both walls stand about 16 ft. high. A large amount of this concrete must be removed to meet the construction specifications for the laboratory.

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Using Linde's powder lance, the concrete walls are being cut into huge sections measuring 20 x 16 ft. and weighing up to 18 tons apiece. Cutting speed is about 1½ ft. per hour. After each of the sections has been severed, it is hoisted out of the pit by a 100-ton bridge crane and hauled away.

This unusual demolition project, which is being handled by James E. Lowe & Sons of Schenectady, N. Y., will take from 4 to 6 weeks to complete. H. N. Lowe, president of the firm, estimates that savings of from 30 to 40 per cent will be realized on this job—thanks to powder-lancing. Lowe also stated that the lancing operation will consume the following materials:

Oxweld Iron Powder.....20,000 lb.
Aluminum Powder ..... 6,000 lb.
Black Iron Pipe ..... 8,000 ft.
Oxygen .....450,000 cu. ft.

Curtain Wall Called Significant Product

With the evolution of architecture from the "Sculptural Look" of the Nineteenth Century to the geometrical simplicity of today, a new family of building products has been born. Curtain wall is the most significant of the newcomers.

Current industry estimates place annual curtain wall volume at nearly $100 million — 600 per cent above the 1950 figure. By 1965, annual sales of the growing curtain wall industry will soar to over $325 million, according to Kawneer Company, Niles, Michigan, one of the nation's leading manufacturers of building wall systems.

Curtain wall is best defined as an exterior non-loadbearing wall—or "skin"—consisting of panels attached directly to the building framework or to supports which are, in turn, attached to the framework. The exterior surface of the panels constitutes the building's facade.

The advantages of modern metal-and-glass building skins are many. Instead of laboriously erecting a wall brick by brick or stone by stone, a builder can now install a wall system using large prefabricated metal sections at a fraction of the time it took formerly. This means reduced costs as well as earlier occupancy. Additionally, thinner walls provide more income-producing floor space for a given area. When properly engineered, modern curtain wall systems also enjoy excellent insulating properties, safely accommodate thermal expansion and contraction, and resist weathering.

Technological advances continue as industry pioneers invest increasing sums in research. According to Jack M. Roehm, director of research of Kawneer Company, the future should see the following developments emerge:

1. Finished inside-outside curtain wall package. This type of unit, which provides finished interior and exterior wall surfaces upon installation, has been realized to some extent already. But, a perfected system taking full advantage of the numerous synthetic materials is still in the research stage.
2. Radiant heating panels. Building the heating function directly into the panel wall will result in more comfort and economy. Controlling temperatures at the building wall is considered the ideal arrangement.
3. Integrated utility panels. Successful development of this panel will permit factory-fabricated walls to include plumbing and electrical conduits.
4. Variety of color and form. More economical methods of shaping panels and applying long-life colors will give the architect even greater design leeway in curtain wall construction.
5. Sun control. Solar screening elements will be neatly packaged into the panel to present a unified, attractive appearance. Automatic control will maintain ideal sun-shielding conditions throughout the day.

Over 40 companies now furnish curtain wall materials but many are concerned primarily with producing panels or windows only. A number of them operate on a regional or local basis. However, a few companies have developed to the point where they are able to engineer and install entire curtain walls throughout the country.

Of significance, more and more curtain walls are being used today for small and medium-size buildings as well as for skyscrapers. Aiding this trend is a new "Unit Wall" system of ten prefabricated modular wall components, recently developed by Kawneer. With these few units, an architect can achieve over 33,000 design combinations in the construction of one, two and three-story buildings.

Interestingly, the curtain wall concept is not new. Its beginning lies deep in time when lattice and basket-weave huts of early homebuilders were literally "curtained" with animal pelts or foliage.

But, it was the invention of the steel skeleton frame—the first steel skeleton building was erected in 1883—that gave birth to the type of curtain wall construction which preceded the systems we know today.

The trend toward lightweight metal-and-glass building skins gained impetus after World War II. New architectural conceptions, together with technical achievements in fabricating, began changing the fundamental view of how a building should look. Thus, Americans were provided with a new architectural form which they have come to prefer.

As a result, curtain wall has come to symbolize contemporary Western culture, in much the same way that Gothic, Renaissance, and Romanesque styles epitomized earlier eras.

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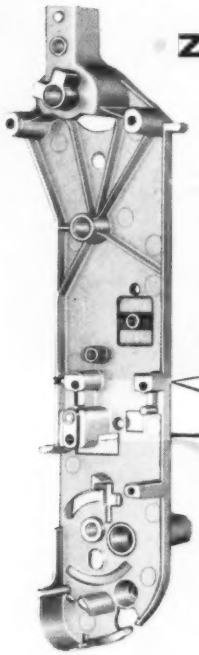

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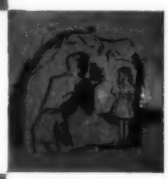

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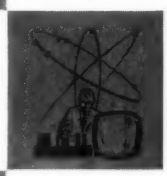

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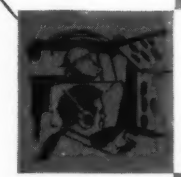

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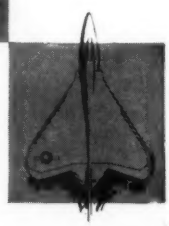

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